



A56 Bioarchaeological Investigations Discovered Intraindividual Bilateral Ossification Differences of the Medial Clavicle — Implications for Age Estimation of the Living

Fabian Kanz, PhD, Medical University of Vienna, Department of Forensic Medicine, Sensengasse 2, Vienna, YT 1090; Philipp Konermann, MD, Department of Forensic Medicine, Medical University of Vienna, Sensengasse 2, Vienna 1090; and Sandra Lösch, PhD, University of Bern, Institute of Forensic Medicine, Dept of Physical Anthropology, Sulgenauweg 40, Bern 3007, SWITZERLAND*

After attending this presentation, attendees will: (1) understand how bioarchaeological studies on human remains can support research in forensic anthropology; and, (2) be aware of possible ossification differences of the left and right clavicle and the implications for the procedure of age estimation of the living.

This presentation will impact the forensic science community in terms of knowledge and competence to modify the procedure of age estimation of the living by considering the development of the medial epiphysis of both clavicles, which will enhance the accuracy of the method.

Age determination in the living is put into practice both in criminal and asylum law. Within the standardized multifactorial examination by experts, the evaluation of the stage of ossification of the medial clavicle is of crucial importance. The complete fusion of the epiphysis is believed to be closely related to the time at which the age of legal majority is reached in many countries. In recent times, serious doubts arose concerning the assumption that bilateral ossification differences of the medial clavicle are negligible for age determination.¹ Asymmetric workload an individual is exposed to during his/her skeletal growth period might be responsible for differences in the ossification progress of the clavicles. A Medieval and an Early Modern Age population were chosen for investigation, assuming that workload conditions in historic times may better reflect the living conditions (hard manual labor) in countries from which the majority of the individuals subjected to age estimation procedures (asylum seeker and immigrants) in Austria and Switzerland originate.

The investigated individuals were collected during the archaeological excavation of a cemetery in St. Pölten in Lower Austria. Both clavicles of 70 females, 88 males, and 42 individuals with morphologically indeterminable sex were macroscopically investigated twice. Each clavicle was rated on the basis of the five-stage classification provided by Schmeling et al.² Definition of the five-stages (I–V) are: Stage I — non-ossified epiphysis; Stage II — discernible ossification center; Stage III — partial fusion; Stage IV — total fusion but epiphyseal scar still visible; and, Stage V — total fusion and epiphyseal scar no longer visible. Relative differences of the two clavicles in each ossification stage as well as inter-observer error as Overall Percentage Agreement (OPA) and Kappa value (κ) of the two independent observations were calculated. The χ^2 test was performed to investigate significant dissimilarities of side differences observed in the investigated ossification stages.

The distribution of the 200 investigated clavicle pairs was found to be nearly equal in the defined five stages and maximum side differences did not exceed one stage. In Stage I, 14.3% of the individuals showed side differences, 15.6% in Stage II, 50.0% in Stage III, 15.0% in Stage IV, and 13.5% in Stage V. For the individuals with known sex, the females (24.7%) tend to have stage differences more often than males (14.7%). The differences were found to be most pronounced in Stage III (females=61.5% and males=33.3%).

The inter-observer error turned out to be acceptable as evidenced by an OPA of 88.0% and the κ -value=0.83. The χ^2 test indicated significant differences ($p=0.001$, $\alpha=0.05$) in the ossification stages only when Stage III was included. If Stage III was excluded, no significant differences between the Stages I, II, IV, and V could be found ($p=0.995$).

Since Stage III is most important for the decision of if an individual has already reached the age of legal majority or not, and the greatest bilateral differences were found in this stage. It is strictly recommended that both the left and right clavicle should be investigated during the age estimation procedure. In case of discrepancy, the clavicle expressing the ossification stage which promotes the interest of the investigated person should be favored in terms of “*in dubio pro minore*.”



Anthropology Section - 2016

Reference(s):

1. Bassed R.B., Briggs C., Drummer O.H. The incidence of asymmetrical left/right skeletal and dental development in an Australian population and the effect of this on forensic age estimations. *Int J Legal Med* 2012;126:251–7.
 2. Schmeling A., Schulz R., Reisinger W., Mühler M., Wernecke K.-D., Geserick G. Studies on the time frame for ossification of the medial clavicular epiphyseal cartilage in conventional radiography. *Int J Legal Med* 2004;118:5–8.
-

Bioarchaeology, Medial Clavicle, Bilateral Ossification